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NATIONAL DAM INSPECTION PROGRAM. GORSON DAM (NDI ID NUMBER PA-0--ETC(U)
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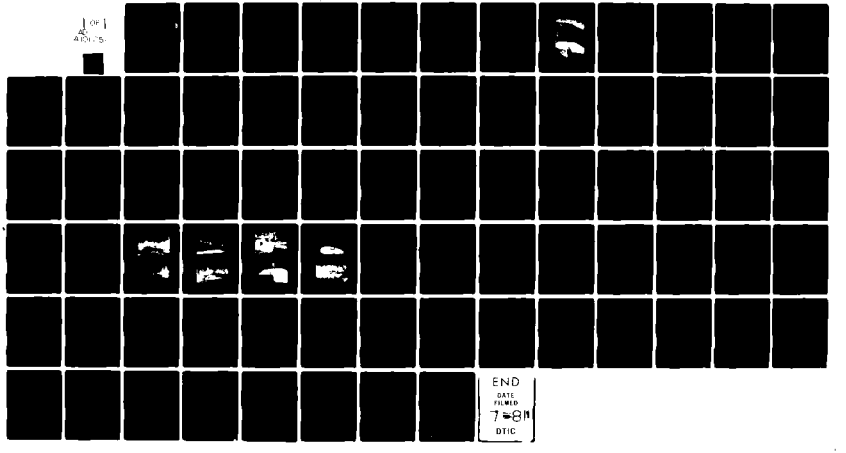

DELAWARE RIVER BASIN

MILL CREEK, PIKE COUNTY

PENNSYLVANIA

LEVEL II

GORSON DAM

NDI ID NO PA-01084
DER ID NO 52-61

GIRL SCOUTS OF DELAWARE COUNTY, INC.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

National Dam Inspection Program. Gorson Dam (NDI ID Number PA-01084, DER ID Number 52-61, Delaware River Basin, Mill Creek, Pike County, Pennsylvania. Phase I Inspection Report,

"Original contains color plates: All DTIC reproductions will be in black and white"

Prepared by
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
Harrisburg, Pennsylvania 17105

DACW 31-81-C-0018

For
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

11 MAY 1981

DELAWARE RIVER BASIN

MILL CREEK, PIKE COUNTY

PENNSYLVANIA

GORSON DAM

NDI ID No. PA-01084

DER ID No. 52-61

GIRL SCOUTS OF DELAWARE COUNTY, INC.

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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For

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Baltimore, Maryland 21203

MAY 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

GORSON DAM

NDI ID No. PA-01084; DER ID No. 52-61

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Gorson Dam NDI ID No. PA-01084 DER ID No. 52-61
Size:	Small (11.4 feet high; 101 acre-feet)
Hazard Classification:	High
Owner:	Girl Scouts of Delaware County, Inc. 594 South New Middletown Route Media, Pennsylvania 19063 Attn: Miss Gamber, Program Director
State Located:	Pennsylvania
County Located:	Pike
Stream:	Mill Creek
Date of Inspection:	16 April 1981

Based on the criteria established for these studies, Gorson Dam is judged to be unsafe, nonemergency, because the spillway capacity is seriously inadequate. The recommended Spillway Design Flood (SDF) for the size and hazard classification of the dam varies between 1/2 of the Probable Maximum Flood (PMF) and the PMF. The selected SDF is the 1/2 PMF. The existing spillway will pass only about 20 percent of the PMF before overtopping of the dam occurs. It is judged that the dam could not withstand the depth and duration of overtopping that would occur for the 1/2 PMF. If the low areas on the top of the dam were filled to the design elevation, the spillway would pass about 36 percent of the PMF without any overtopping. For either condition, the spillway capacity is rated as seriously inadequate. Failure of Gorson Dam would cause an increased hazard for loss of life downstream.

Overall, the dam is considered to be in good condition. The major deficiency observed was the installation of flashboards on the spillway crest. The flashboards cannot be relied upon to fail with the pool at top of dam. Several other

deficiencies were observed, all of which are considered to be minor. Maintenance of the dam and its appurtenant structures is generally adequate.

The following studies and remedial measures, listed in approximate order of priority, are recommended to be immediately undertaken by the Owner:

(1) Remove flashboards from the spillway crest.

(2) Perform additional studies to more accurately ascertain the spillway capacity required for Gorson Dam as well as the nature and extent of measures required to provide adequate spillway capacity. Take appropriate action as required.

(3) Fill in the low areas on the top of dam.

(4) Repair the depressed areas on the upstream slope.

(5) Remove brush from the dam.

All investigations, studies, designs, and construction inspection should be performed by a professional engineer experienced in the design and construction of dams.

In addition, the Owner should formalize the operational and maintenance procedures as follows:

(1) Formalize the emergency warning system and develop a detailed emergency operation procedure for Gorson Dam. When warnings of a major storm are given by the National Weather Service, the Owner should activate the emergency and warning system.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of the dam.

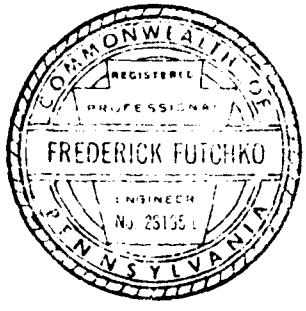
(3) Initiate an inspection program such that the dam is inspected on a regular basis. As presently required by the Commonwealth, the inspection program should include a formal annual inspection by a professional engineer experienced in the design and costruction of dams. Utilize the inspection results to determine if remedial measures are necessary. During annual inspections, particular attention should be given to the condition of the concrete at the spillway, to possible seepage problems at the pond located at the toe of the embankment, to the wet area, and to the localized settlement of the riprap.

(4) Continue the current maintenance program and develop a formal maintenance manual so that all features of the dam are properly maintained.

GORSON DAM

Submitted by:

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.



FREDERICK FUTCHKO
Project Manager, Dam Section

Date: 18 June 1981

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF
ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
Commander and District Engineer

Date: 24 JUNE 1981

GORSON DAM

Overview

GORSON DAM

NDI ID No. PA-01084; DER ID No. 52-61

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

SECTION 1

PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Gorson Dam is an earthfill structure that includes a 332-foot long main embankment and a 200-foot long dogleg at the left end. The main embankment is 11.4 feet high at maximum section and the dogleg has an average height of about 3 feet. The topwidth of the dam is 13.5 feet. The upstream slope of the main embankment is protected with riprap and has a slope of about 1V on 2.5H. The upstream slope of the dogleg section is grass covered and has a slope of about 1V on 2.5H. The downstream slopes of the main embankment and dogleg sections are grass covered and have slopes of about 1V on 2.5H. The main embankment section has a 1-foot thick corewall which is reportedly founded on hardpan, about 3 feet below the original ground surface. The elevation of the top of the corewall is 1 foot above the spillway crest level.

The spillway, located at the right abutment, is a concrete gravity structure with a rounded weir crest. The crest of the weir is 35.2 feet long and 3.6 feet below the design top of dam. The spillway approach channel is earth lined, and the spillway apron and exit chute are concrete. The spillway has a concrete retaining wall on the left side adjacent to the embankment. The right side of the spillway is keyed into rock outcrop at the right abutment of the dam.

The outlet works is located to the left of the spillway. It consists of an 18-inch reinforced concrete pipe, encased in concrete, with a gate valve at the upstream end and an endwall at the downstream end. The lower portion of the gate valve operating mechanism is attached to a concrete gate structure with its top a few feet below the spillway crest level. The upper portion of the gate valve operating mechanism is attached to a steel frame which is fabricated from approximately 2-inch angles which in turn are attached to the top of the concrete structure.

The various features of the dam are shown on the photographs in Appendix C and on the plates in Appendix E. A description of the geology is included in Appendix F.

b. Location. Gorson Dam is located on Mill Creek about 2.5 miles above its confluence with the Delaware River in Lehman Township, Pike County, Pennsylvania, about 7 miles northeast of Bushkill. The dam is shown on the USGS Quadrangle, Lake Maskenozha, Pennsylvania, at latitude N 41° 10' 48" longitude W 74° 56' 12". A location map is shown on Plate E-1.

c. Size Classification. Small (11.4 feet high, 101 acre-feet).

d. Hazard Classification. Downstream conditions indicate that a high hazard classification is warranted for Gorson Dam (Paragraphs 3.1e and 5.1c (5)).

e. Ownership. Girl Scouts of Delaware County, Inc., 594 South New Middletown Route, Media, Pennsylvania 19063, Attn: Miss Gamber, Program Director.

f. Purpose of Dam. Recreation.

g. Design and Construction History. Construction of the original structure was started in 1926 by Mr. John Schoonover without the aid of plans and without a permit from the Commonwealth. During construction, the Commonwealth informed Mr. Schoonover that the dam would not meet its requirements if it were completed as he had intended. In 1927, in order to comply with the Commonwealth's requirements, Mr. Schoonover retained Mr. John L. Westbrook, Professional Engineer, to prepare plans to modify the dam. In 1929, the Commonwealth issued a permit for construction of the dam and it was subsequently completed. The plans prepared by Mr. Westbrook showed the spillway at the left abutment, but an inspection made after the dam was completed noted that it was constructed at the right abutment. The original spillway had a sharp-crested weir with a crest length of 24 feet. The original outlet conduit was an 18-inch cast-iron pipe.

In about 1945, the dam was purchased by Mr. Joseph N. Gorson. In 1947, the left spillway wall had fallen over. In order to repair the wall, the pool had to be drawn down. The Contractor who made the repairs breached the dam in order to draw down the pool. The Commonwealth objected to the lack of design drawings for the repairs. Mr. Gorson then retained Mr. Mr. Walter H. Sebring, Professional Engineer, to prepare plans for repairs and modifications to the dam. Based on these plans, repairs and modifications were made in 1949. Modifications made included rounding the crest of the gravity concrete spillway and constructing the dogleg at the left abutment.

The present Owner, Girl Scouts of Delaware County, Inc., acquired the dam in 1959. In the winter of 1976-1977, the concrete gate structure and outlet conduit were damaged due to ice loads. Achterman Associates, Consulting Engineers, were obtained to design repairs to the structures and to prepare a grouting plan to reduce seepage in the area of the outlet conduit. The repairs were made by G. H. Litts and Sons, Inc., in 1978. Repairs to the gate structure involved removing about 3 feet from the top of the structure so that its top would be a few feet below spillway crest level. A new gate valve was installed and steel angles were attached to the top of the gate structure to which the gate operating mechanism was attached. A major crack in the conduit was repaired by grouting. Seepage under the corewall and spillway were reduced by grouting.

h. Normal Operational Procedure. Except during the recreation season, the reservoir is maintained at spillway crest with inflow discharging over the spillway. During the recreation season, approximately April through September, flashboards are installed on the spillway crest and the reservoir is maintained at a level 1 foot higher than the spillway crest.

1.3 Pertinent Data.

a.	Drainage Area. (square miles)	1.2
b.	Discharge at Damsite. (cfs)	
	Maximum known flood	Unknown
	Outlet works at maximum pool elevation	30
	Spillway capacity at maximum pool elevation	
	Existing conditions	530
	Design conditions	930
c.	Elevation. (feet about msl.)	
	Top of dam	
	Design conditions	1011.6
	Existing conditions	1010.5

c.	Elevation. (cont'd.)	
	Maximum pool	
	Design conditions	1011.6
	Existing conditions	1010.5
	Normal pool (spillway crest)	1008.0
	Normal pool (flashboards in place)	1009.0
	Upstream invert outlet works	Unknown
	Downstream invert outlet works	999.1
	Streambed at toe of dam	999.1
d.	Reservoir Length. (miles)	
	Normal pool (spillway crest)	0.29
	Maximum pool (design)	0.30
e.	Storage. (acre-feet)	
	Normal pool	53
	Maximum pool (design conditions)	123
	Maximum pool (existing conditions)	101
f.	Reservoir Surface. (acres)	
	Normal pool (spillway crest)	18
	Maximum pool (design)	21
	Maximum pool (existing)	20
g.	Dam.	
	Type	Earthfill
	Length (feet)	
	Main embankment	332
	Dogleg	200
	Height (feet)	11.4
	Topwidth (feet)	
	Design	10.0
	Existing	13.5
	Side Slopes	
	Upstream	
	Design	1V on 2H
	Existing	1V on 2.5H
	Downstream	
	Design	1V on 2H
	Existing	1V on 2.5H
	Zoning	Concrete corewall
	Cutoff	Corewall extending 3 feet below original ground
	Grout Curtain	Single line grout curtain

h.	Diversion and Regulating Tunnel.	None
i.	Spillway.	
	Type	Concrete gravity; round crest with 45° upstream face
	Length of Weir (feet)	35.2
	Crest Elevation	1008.0
	Upstream Channel	Earth-lined approach channel
	Downstream Channel	Concrete-lined apron
j.	Regulating Outlets.	
	Type	One 18-inch diameter RCP
	Length (feet)	62
	Closure	Gate valve at upstream end; size unknown
	Access	By boat

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. The data available include design drawings for the original structure, design drawings and specifications for the 1949 reconstruction, and drawings for the 1978 repair work.

b. Design Features. The project is described in Paragraph 1.2a. The various features of the dam are shown on the photographs in Appendix C and on the plates in Appendix E.

c. Design Conditions. Design information for the dam is limited and is not considered sufficient to assess the design of the dam.

2.2 Construction Data.

a. Data Available. Construction data include a letter from the design engineer to the Commonwealth certifying that the 1949 reconstruction work was performed according to approved drawings and specifications, a letter from the Commonwealth to the Owner stating that an inspection of the 1949 reconstruction work indicated that the work was completed in accordance with plans submitted to the Commonwealth, and Commonwealth inspection reports for the 1949 reconstruction work. Very little construction data were available for the 1978 repair work.

b. Construction Considerations. The available data are insufficient to assess the construction of the dam.

2.3 Operation. There are no formal records of operation. Correspondence indicates that there has been some difficulty in maintaining the desired recreation pool elevation. Records of inspections performed by the Commonwealth are available for the period from 1950 to 1955. A summary of the inspection reports is included in Appendix A.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dams and Waterway Management, Department of Environmental Resources, Commonwealth of Pennsylvania (PennDER). The caretaker represented the Owner and was available for information during the visual inspection.

b. Adequacy. The type and amount of available design data and other engineering data are fair, and the assessment is based on the combination of available data, visual inspection, performance history, hydrologic and hydraulic assumptions, and calculations developed for this report.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam and appurtenant structures is good. Some minor deficiencies were observed as noted below. A sketch of the dam with the locations of the deficiencies is presented on Exhibit B-1 in Appendix B. Survey information acquired for this Report is summarized in Appendix B. Datum used for the survey was the spillway crest, Elevation 1008.0, as estimated from USGS contour mapping. On the day of the inspection, the pool elevation was 0.2 foot above the spillway crest level.

b. Embankment. The embankment is generally in good condition. There are low areas along the top of both the main embankment and the dogleg. The lowest area is along the dogleg and it is 1.1 feet below the design elevation of the top of the dam.

There is a slight displacement of the riprap at two locations along the upstream slope of the main embankment. About 200 feet from the left end of the main embankment, the riprap has a 3-foot wide by 1-foot deep depression. About 30 feet from the spillway, the riprap is uneven over a length of 8 to 10 feet. This may be the location where a temporary dike was installed to facilitate repair of the gate structure in 1978.

There is a wet area at the toe of the downstream slope of the main embankment about 2 feet in diameter. It is about 250 feet from the left end. No seepage was noted. The wet area was noted in previous inspections by the Commonwealth. The source of the water may be normal hillside runoff.

The dogleg was not constructed as designed. The 1949 reconstruction plans for Gorson Dam show a dogleg section which is about 80 feet long. The length is about 200 feet. There is evidence in the PennDER files that the dogleg was modified by the contractor during the reconstruction of the dam in 1949.

A small amount of brush is growing on the upstream slope of the dam.

A pond has been created at the toe of the dam adjacent to the conduit. It is roughly circular, with an approximate diameter of 25 feet. It is estimated to be 4 to 6 feet deep. The pond was constructed during the 1978 repair program for the outlet conduit and gate structure. According to the caretaker, it was the sediment control facility. It is currently used as a nature study location.

c. Appurtenant Structures. The outlet works is in good condition. The caretaker reported that the valve is operated annually to draw down the reservoir slightly to facilitate flashboard removal.

The spillway is in good condition. Some superficial erosion of the downstream face has taken place. The spillway apron is concrete; riprap is shown on the design plans. The left spillway retaining wall shows some leaching along minor longitudinal hairline cracks, and some localized scaling on the horizontal surfaces. Flashboards extend across part of the spillway crest (Photograph E). They are fabricated from a 3/8-inch metal plate and are 12 inches high. The flashboards are supported on 1-inch diameter steel pins on about 5-foot centers.

d. Reservoir Area. The watershed has moderate slopes and is used primarily as recreation woodlands. The only significant development within the watershed is the Girl Scout camp around the reservoir.

e. Downstream Conditions. The outlet channel of the dam is clear of debris. The stream flows for about 2,000 feet down a narrow ravine containing a small waterfall and then flows adjacent to three low-lying dwellings. Just downstream, the valley becomes slightly wider, and the stream crosses under a road. Downstream from the road, there is an additional low-lying dwelling. Some other dwellings are located downstream from the road but are well above streambed. Beyond these structures, the stream crosses under two small roads, and then extends through a narrow ravine down to the Delaware River floodplain. There is no existing development on the Delaware River floodplain susceptible to flooding from the stream. It is possible that six or more lives would be lost in the event of a dam failure. Accordingly, a high hazard classification has been assigned to Gorson Dam.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. Except during the recreation season, the reservoir is maintained at spillway crest with excess inflow discharging over the spillway. During the recreation season, April through September, 12-inch high flashboards are installed and the reservoir is maintained at the top of the flashboards. The outlet works is used to draw down the reservoir after the end of the recreation season to facilitate removing the flashboards.

4.2 Maintenance of Dam. The dam is visited daily by the caretaker, who lives in a house immediately downstream from the dam. The need for maintenance is determined by the caretaker. Major repairs have to be approved by the Owner. The caretaker normally performs routine maintenance duties such as mowing and clearing brush in addition to flashboard removal. Formal inspections of the dam are not made.

4.3 Maintenance of Operating Facilities. The outlet works operating mechanism is maintained by the caretaker and operated annually.

4.4 Warning Systems in Effect. There is an informal emergency warning system at Gorson Dam. A fire whistle at the camp is used to provide local warning, and telephone contact would be made with the downstream residents in the event of an emergency at the dam.

4.5 Evaluation of Operational Adequacy. Except for a few minor deficiencies, the maintenance of the dam and appurtenant works is adequate. The frequency of inspection by the caretaker is good, but a program of formal annual inspection is necessary to detect potentially hazardous conditions. A formalized emergency operation and warning system is necessary to reduce the risk of dam failure should adverse conditions develop and to prevent loss of life should the dam fail.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The permit application for the reconstruction of Gorson Dam in 1949 indicated that the design capacity of the spillway was 960 cfs based on a spillway length of 34 feet and a maximum head of 4 feet. However, the plans show a maximum available head of 3.6 feet. The dam was constructed with a spillway length of 35.2 feet and a maximum available head of 3.6 feet.

b. Experience Data. There are no known records of the maximum reservoir elevation at Gorson Dam.

c. Visual Observations.

(1) General. The visual inspection of Gorson Dam, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein.

(2) Embankment. The top of the main embankment and the dogleg are not at their design elevations. This reduces the spillway capacity.

(3) Appurtenant Structures. With the exception of the flashboards, no deficiencies relevant to hydraulics were observed at the spillway or the spillway exit channel. The analysis described hereinafter assumed that the flashboards were not in place. The flashboards are not considered to be a reliable means of increasing spillway capacity because the ultimate stress required to break flashboard pins is difficult to predict accurately. The gate operating mechanism has no access other than by boat. The operation of the gate could not be insured during a flood and, therefore, the capacity of the outlet conduit is not included in the analysis.

(4) Reservoir Area. No conditions in the watershed or reservoir area were observed that might present a hazard to the dam.

(5) Downstream Conditions. No conditions were observed downstream from the dam that would reduce the spillway capacity. Failure of Gorson Dam would probably flood four dwellings, with a resultant loss of life. Property damage would also occur. The downstream conditions indicate that a high hazard classification is warranted for Gorson Dam.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (small) and hazard potential (high) of Gorson Dam is between one-half of the Probable Maximum Flood (PMF) and the PMF. Because the size of Gorson Dam is at the low end of the small size classification, the 1/2 PMF is selected as the SDF. The watershed and reservoir were modeled with the U.S. Army Corps of Engineers HEC-1DB computer program. A description of the model is included in Appendix D. The assessment of hydrology and hydraulics is based on existing conditions, and the effects of future development are not considered.

(2) Summary of Results. Pertinent results are tabulated at the end of Appendix D. The analysis reveals that the existing Gorson Dam can pass about 20 percent of the PMF before overtopping of the dam occurs. During the 1/2 PMF, the dam would overtop by 1.2 feet for 5.8 hours. This would cause failure of the dam. The dam is rated at the previously noted minimum top of dam elevation. If the low areas on the top of the dam were filled to the design elevation, the spillway would pass about 36 percent of the PMF without any overtopping.

(3) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix D. Because Gorson Dam cannot pass the 1/2 PMF, a failure analysis was performed. It was assumed that Gorson Dam would begin to fail during the 40 percent PMF. Assumptions used to model the failure are described in Appendix D. The resulting outflow was routed downstream. Failure of Gorson Dam during the 40 percent PMF would raise the water levels near dwellings by up to 4.1 feet over levels that existed just prior to failure of the dam. A typical downstream section is shown in Appendix D. There is an increased hazard for loss of life. The spillway capacity of Gorson Dam is rated as seriously inadequate. If the low areas on the dam were filled to the design elevation, the spillway capacity would still be rated as seriously inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Gorson Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for the various features.

(2) Embankment. The wet area near the toe of the embankment is judged not to be of concern. At present, the brush on the embankment is a minor maintenance problem. Although no seepage was observed at the pond located at the toe of the embankment, seepage could be obscured by the pond. The pond, at the present time, is judged not to be of concern; however, particular attention for possible seepage problems at the pond area is warranted during future inspections. The localized settlement of the riprap is not of concern if no further settlement occurs.

(3) Appurtenant Structures. The minor deterioration and cracking of the left spillway wall is a maintenance problem and is not a hazard to the dam at present.

b. Design and Construction Data. No stability analyses are available for the embankment. There are no data concerning either the composition of the embankment or the foundation conditions.

c. Operating Records. There are no formal records of operation.

d. Post-construction Changes. Post-construction changes are described in Paragraph 1.2g. The changes have been assessed with the dam.

e. Seismic Stability. Gorson Dam is located in Seismic Zone 1. Earthquake loadings are not considered to be significant for small dams located in Seismic Zone 1 when there are no readily apparent stability problems. Since there are no readily apparent stability problems, the ability of the embankment to withstand an earthquake is assumed to be adequate.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND

PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on available records, visual inspection, calculations, and past operational performance, Gorson Dam is judged to be in good condition. Based on the size and hazard classification of the dam, the recommended SDF at the dam varies between the 1/2 PMF and the PMF. The selected SDF is the 1/2 PMF. Based on existing conditions without flashboards on the spillway crest, the spillway will pass about 20 percent of the PMF before overtopping of the dam occurs. It is judged that the dam could not withstand the depth and duration of overtopping that would occur during storms greater than 40 percent of the PMF. Failure of Gorson Dam would cause an increased hazard for loss of life downstream. The spillway capacity is rated as seriously inadequate. According to criteria established for these studies, the dam is judged to be unsafe, non-emergency, because the spillway capacity is seriously inadequate. If the low areas on the top of the dam were filled to the design elevation, the spillway would pass about 36 percent of the PMF without any overtopping. The spillway capacity would still be rated as seriously inadequate.

(2) Overall, the dam is considered to be in good condition. The major deficiency observed was the installation of flashboards on the spillway crest. The flashboards cannot be relied upon to fail with the pool at top of dam. Several other deficiencies were observed, all of which are considered to be minor.

(3) A summary of features and observed deficiencies is as follows:

Feature	Observed Deficiency
Embankment:	Low areas on embankment; localized settlement of riprap at two locations; wet area at toe of embankment; brush.
Spillway:	Flashboards on crest; left retaining wall concrete scaled along top surface; minor cracking on face of wall.

(b) Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as a part of this study.

(c) Urgency. The recommendations in Paragraph 7.2 should be implemented immediately.

(d) Necessity for Further Investigations. In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations by the Owner will be required.

7.2 Recommendations and Remedial Measures.

a. The following studies and remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Remove flashboards from the spillway crest.

(2) Perform additional studies to more accurately ascertain the spillway capacity required for Gorson Dam as well as the nature and extent of measures required to provide adequate spillway capacity. Take appropriate action as required.

(3) Fill in the low areas on the top of the dam.

(4) Repair the depressed areas on the upstream slope.

(5) Remove brush from the dam.

All investigations, studies, designs, and construction inspection should be performed by a professional engineer experienced in the design and construction of dams.

b. In addition, the Owner should formalize the operational and maintenance procedures.

(1) Formalize the emergency warning system and develop a detailed emergency operation procedure for Gorson Dam. When warnings of a major storm are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of the dam.

(3) Initiate an inspection program such that the dam is inspected on a regular basis. As presently required by the Commonwealth, the inspection program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary. During annual inspections, particular attention should be given to the condition of the concrete at the spillway, to possible seepage problems at the pond located at the toe of the embankment, to the wet area, and to the localized settlement of the riprap.

(4) Continue the current maintenance program and develop a formal maintenance manual so that all features of the dam are properly maintained.

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: Gerson Dam

NDI ID NO.: PA-01084 DER ID NO.: 52-61

Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	Set of design drawings for original dam. Set of design drawings for reconstruction (1949). Design drawings for conduit repair (1977). Design drawings for grouting (1978).
REGIONAL VICINITY MAP	See Plate E-1.
CONSTRUCTION HISTORY	Original dam constructed in 1927. Reconstructed in 1947. Conduit and control tower repaired in 1978. Spillway area, conduit area, and right abutment area grouted in 1978.
TYPICAL SECTIONS OF DAM	See Plate E-2 in Appendix E
OUTLETS: Plan Details Constraints Discharge Ratings	See Plate E-2 in Appendix E

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	None available.
DESIGN REPORTS	Permit application for 1949 reconstruction prepared by Commonwealth describes design.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	None. In 1948 the Commonwealth recommended that the spillway capacity should be at least 960 cfs.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	None.
POSTCONSTRUCTION SURVEYS OF DAM	None.

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	Unknown.
MONITORING SYSTEMS	None.
MODIFICATIONS	Conduit and control tower modified in 1978. Single row grout curtain added in 1978.
HIGH POOL RECORDS	None.
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	Conduit and control tower damaged by ice load in winter of 1976-1977.

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	None.
SPILLWAY: Plan Sections Details	See Plate E-2 in Appendix E.
OPERATING EQUIPMENT: Plans Details	None.
PREVIOUS INSPECTIONS Dates Deficiencies	1950 (1) U/S and D/S not as shown on plans. (2) wet area noted. (3) riprap not as shown on plans. (4) spillway approach not as shown on plans 1950 left end of embankment (dogleg) low. 1950 " " " " " 1956 none. 1965 none.

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: Gorson Dam (Sunset Lake) County: Pike State: Pennsylvania

NDI ID No.: PA-0104 DER ID No.: 52-61

Type of Dam: Earthfill Hazard Category: High

Date(s) Inspection: 16 April 1981 Weather: Clear Temperature: 55°F

Pool Elevation at Time of Inspection: 1008.2 msl/Tailwater at Time of Inspection: 999.8 msl

Note: Elevations estimated from USGS quadrangle - Lake Maskenozha, PA

Inspection Personnel:

D. Wolf (GFCC)

A. H. Whitman, Jr. (GFCC)

D. R. Ebersole (GFCC)

D. Wolf Recorder

T-8

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None apparent,	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	Sediment basin @ toe of dam next to outlet conduit could obscure seepage.
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	None	
CREST ALIGNMENT: Vertical Horizontal	See profile of dam Sheet B-9	
RIPRAP FAILURES	1. localized settlement of riprap (3' wide) 2. depression in riprap 8-10 feet wide @ 300ft from left end, extends into crest	1. none - visually monitor 2. may be location of coffer dam for conduit repair (1978).

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	Low areas as shown on profile - Sheet B-9	Fill in low areas to design elevation.
ANY NOTICEABLE SEEPAGE	Small wet area at toe about 250 feet from left end.	Source may not be from dam.
STAFF GAGE AND RECORDER	None.	
DRAINS	None.	
Brush	Small amount of brush along upstream face near Junction with dogleg.	remove brush

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	18" Concrete pipe (not inspected) No apparent leakage into conduit.	
INTAKE STRUCTURE	Submerged Gate operating wheel supported on angle iron frame	No Access
OUTLET STRUCTURE	Small concrete structure at toe of dam.	
OUTLET CHANNEL	earth-lined channel	
EMERGENCY GATE	no apparent leakage. not operated for inspection.	

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	round crest weir with 12" metal flashboards supported by 1" steel pins @ 5'-cc Crest even an unobstructed	concrete slightly eroded
APPROACH CHANNEL	Earth-lined, unobstructed	
DISCHARGE CHANNEL	Concrete apron, good condition	
BRIDGE AND PIERS	None	
L. Retaining Wall	Some small cracks with calcium deposits. Scaled along top	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	Wooded Valley with steep slope. No significant obstructions.	
SLOPES	Wooded	
APPROXIMATE NUMBER OF HOMES AND POPULATION	8 homes located downstream from dam.	

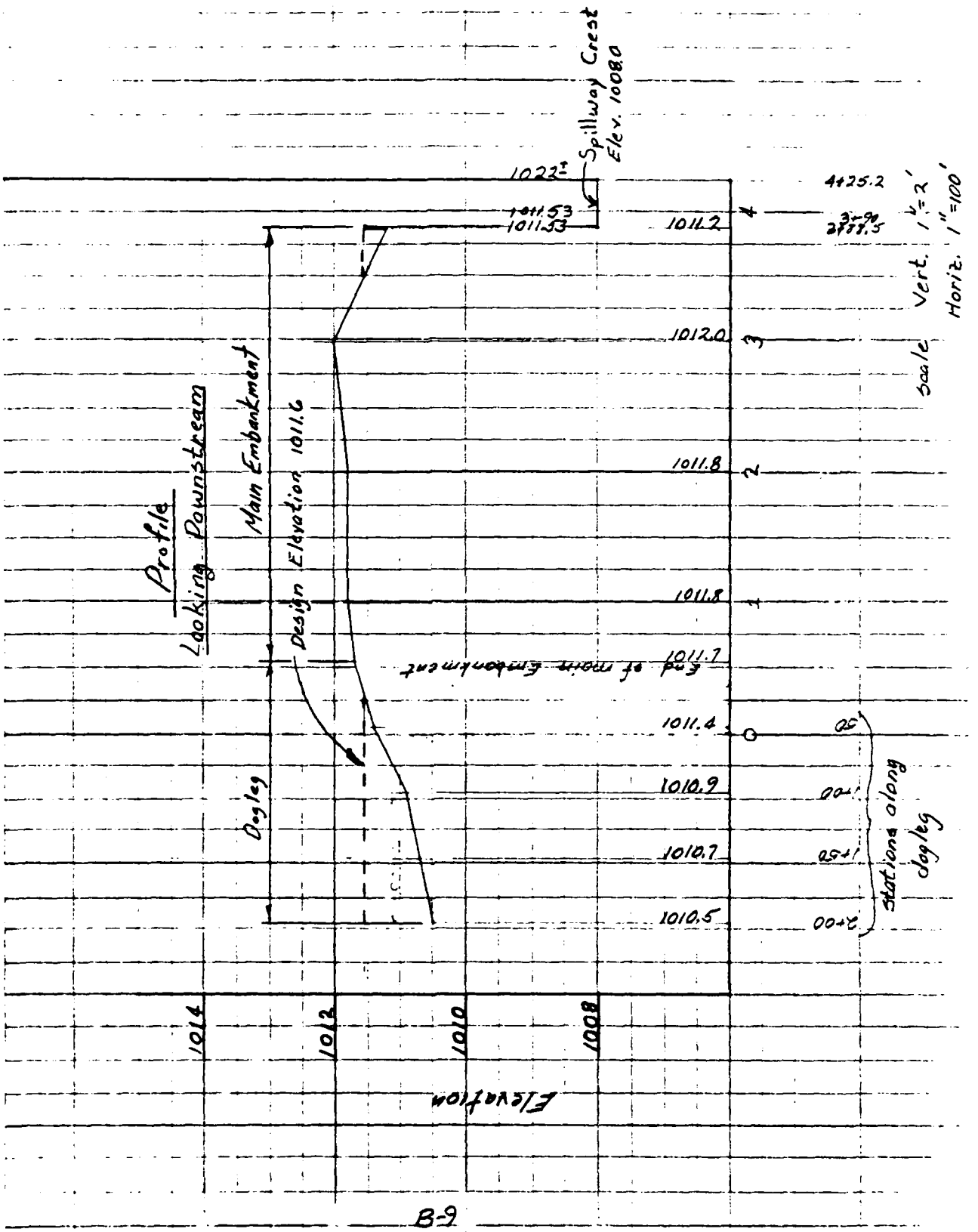
RESERVOIR AND WATERSHED

Sheet 1 of 1

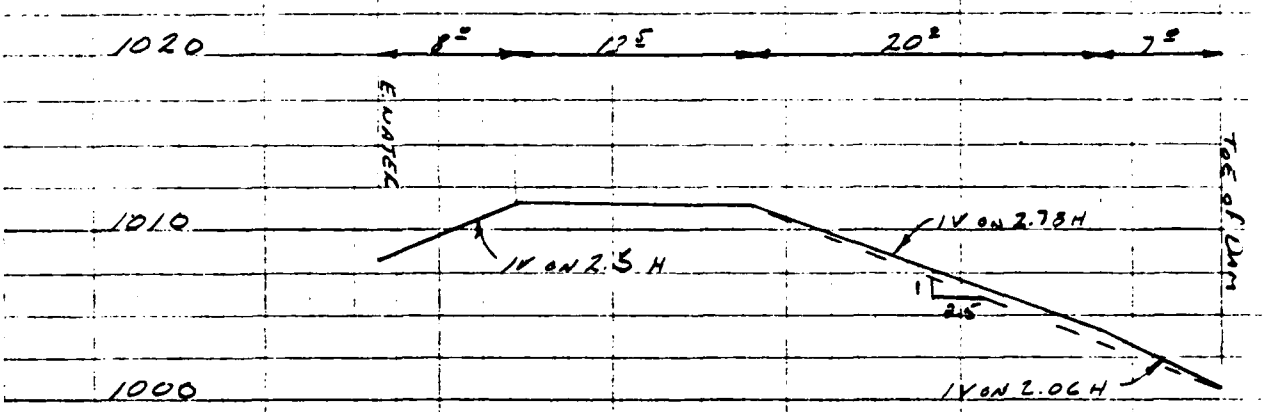
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Mild and wooded. No indications of instability	
SEDIMENTATION	No significant sedimentation observed.	
WATERSHED DESCRIPTION	wooded with some summer residences.	

BY DAW DATE 5/5/21 SUBJECT Gorsan Dam (Sunset Lake Dam) SHEET NO ____ OF ____

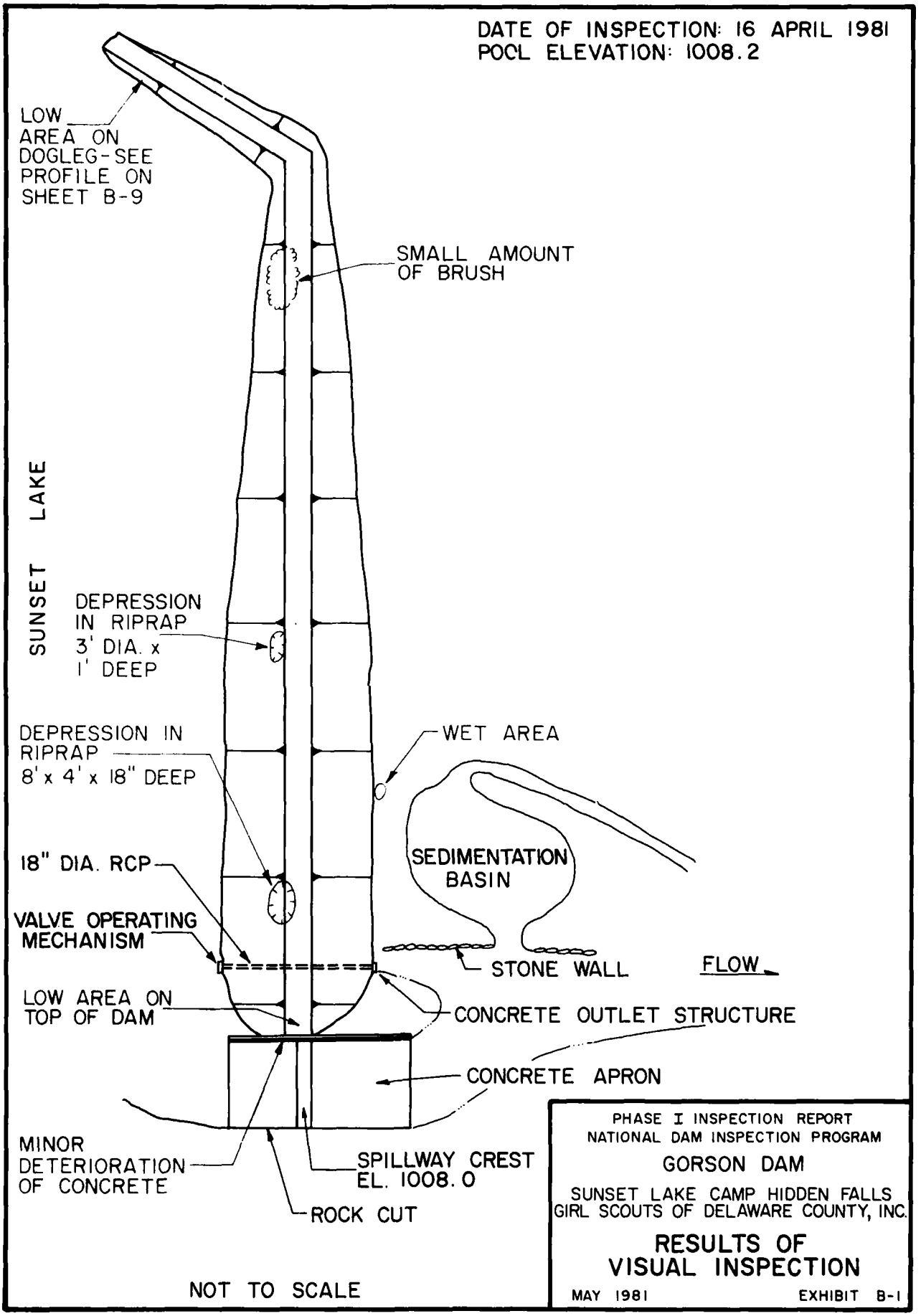
CHKD BY ____ DATE ____ JOB NO 8596.5C



BY DRE DATE 4-21-81 SUBJECT SUNSET LAKE DAM SHEET NO 1 OF
CHKD BY DATE CROSS SECTION JOB NO 8596.5A



SECTION @ STA 3+60


DATE OF INSPECTION: 16 APRIL 1981
POOL ELEVATION: 1008.2
LOW AREA ON DOGLEG - SEE PROFILE ON SHEET B-9
SMALL AMOUNT OF BRUSH
SUNSET LAKE
DEPRESSION IN RIPRAP 3' DIA. x 1' DEEP
DEPRESSION IN RIPRAP 8' x 4' x 18" DEEP
WET AREA
SEDIMENTATION BASIN
18" DIA. RCP
VALVE OPERATING MECHANISM
STONE WALL
FLOW
LOW AREA ON TOP OF DAM
CONCRETE OUTLET STRUCTURE
CONCRETE APRON
MINOR DETERIORATION OF CONCRETE
SPILLWAY CREST EL. 1008.0
ROCK CUT
NOT TO SCALE
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
GORSON DAM
SUNSET LAKE CAMP HIDDEN FALLS
GIRL SCOUTS OF DELAWARE COUNTY, INC.
RESULTS OF VISUAL INSPECTION
MAY 1981
EXHIBIT B-1

APPENDIX C

PHOTOGRAPHS

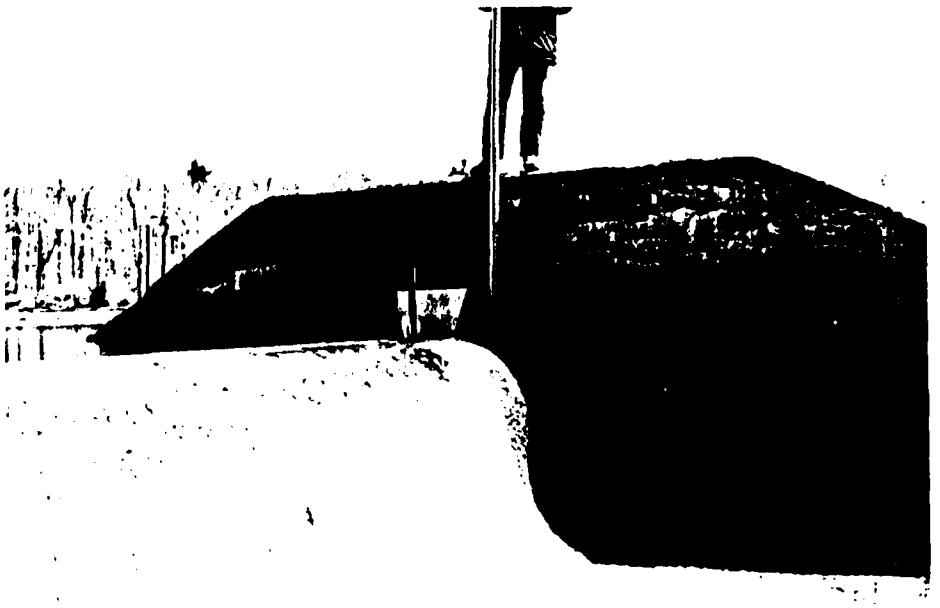
A. Top of dam looking toward right abutment

B. Dogleg along left side of reservoir

C. Riprap along upstream slope

D. Downstream slope

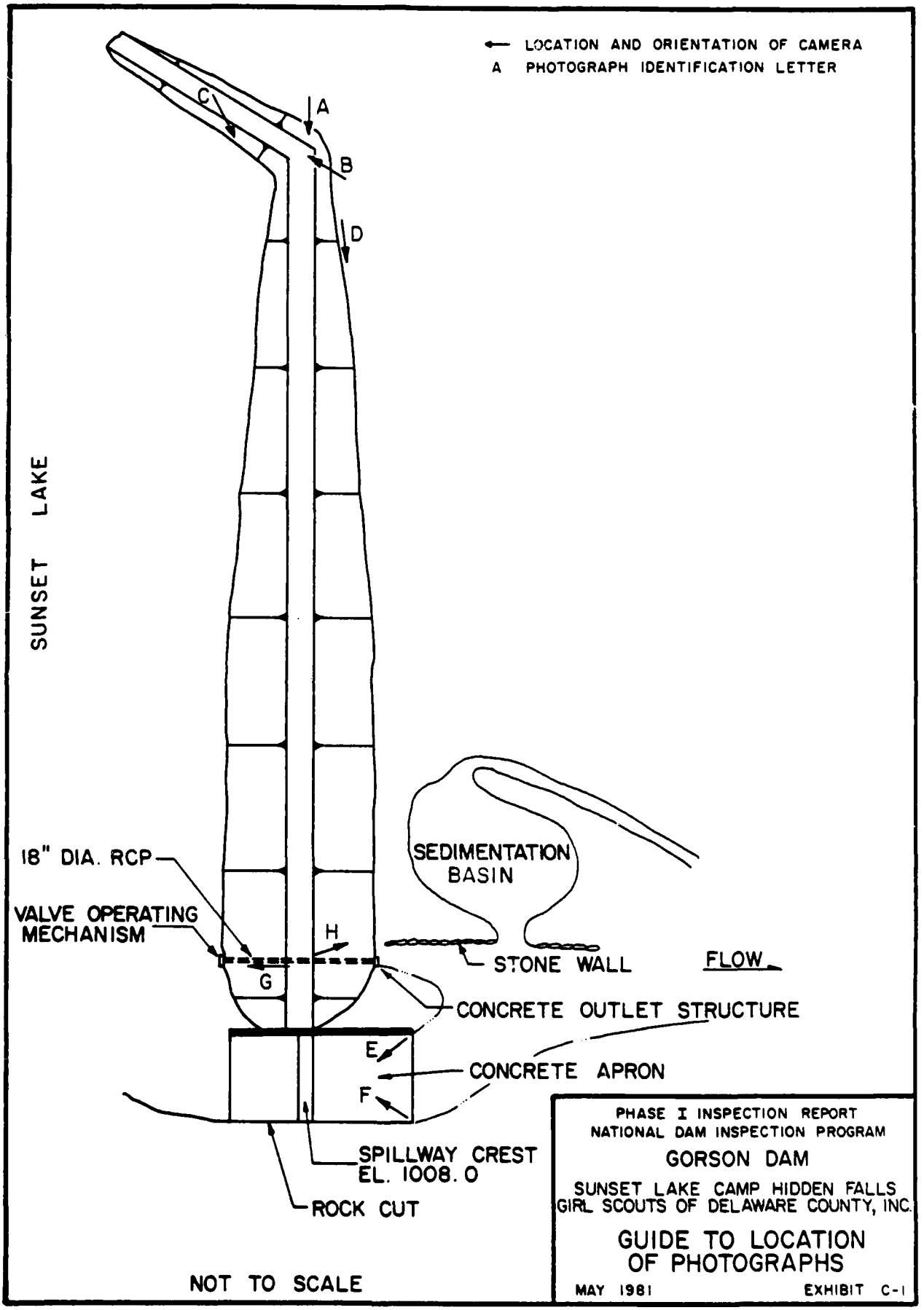
E. Spillway and right abutment of dam with flashboards on part of crest



F. Left spillway retaining wall with flashboards on part of crest

G. Gate operating mechanism

H. Sediment trap at toe of dam



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

GORSON DAM

SUNSET LAKE CAMP HIDDEN FALLS
GIRL SCOUTS OF DELAWARE COUNTY, INC.

GUIDE TO LOCATION OF PHOTOGRAPHS

MAY 1981 EXHIBIT C-1

APPENDIX D

HYDROLOGY AND HYDRAULICS

APPENDIX D

HYDROLOGY AND HYDRAULICS

Spillway Capacity Rating:

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

Description of Model:

If the Owner has not developed a PMF for the dam, the watershed is modeled with the HEC-1DB computer program, which was developed by the U.S. Army Corps of Engineers. The HEC-1DB computer program calculates a PMF runoff hydrograph (and percentages thereof) and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure. By modifying the rainfall criteria, it is also possible to model the 100-year flood with the program.

APPENDIX D

Delaware River Basin
Name of Stream: Mill Creek
Name of Dam: Gorsen Dam
NDI ID No.: PA-01084
DER ID No.: 52-61
Latitude: 41°-10'-47" Longitude: 74°-56'-06"
Top of Dam Elevation: 1011.6 (DESIGN)
Streambed Elevation: 999.1 Height of Dam: 12.5 ft
Reservoir Storage at Top of Dam Elevation: 123 acre-ft
Size Category: Small
Hazard Category: High (see Section 5)
Spillway Design Flood: ½ PMF to PMF
use ½ PMF

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
None				

DOWNSTREAM DAMS

None				

Delaware River Basin
Name of Stream: Mill Creek
Name of Dam: Gerson Dam

DETERMINATION OF PMF RAINFALL & UNIT HYDROGRAPH

UNIT HYDROGRAPH DATA:

Sub-area	Drainage Area (square miles)	Cp (1)	Ct (2)	L miles (3)	L_{ca} miles (4)	L' miles (5)	Tp hours (6)	Map Area (7)	Plate (8)
A	1.19	0.45	1.23	1.55	0.76	—	1.29	1	1
Total	1.19								

(See Sketch on Sheet D-4)

(1) & (2): Snyder Unit Hydrograph coefficients supplied by Baltimore District, Corps of Engineers on maps and plates referenced in (7) & (8)

The following are measured from the outlet of the subarea:

(3): Length of main watercourse extended to divide

(4): Length of main watercourse to the centroid

The following is measured from the upstream end of the reservoir at normal pool:

(5): Length of main watercourse extended to divide

(6): $Tp=C_t \times (L \times L_{ca})^{0.3}$, except where the centroid of the subarea is located in the reservoir. Then $Tp=C_t \times (L')^{0.6}$

Initial flow is assumed at 1.5 cfs/sq. mile

Computer Data: QRCSN = -0.05 (5% of peak flow)
RTIOR = 2.0

RAINFALL DATA:

PMF Rainfall Index= 21.9 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone:	N/A	1
Geographic Adjustment Factor:	N/A	1.0
Revised Index Rainfall:		21.9

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	111
12 hours	123
24 hours	133
48 hours	142
72 hours	N/A
96 hours	N/A

SUNSET LAKE
Sketch of System

Data for Dam at Outlet of Subarea A

Name of Dam: Gorson Dam

SPILLWAY DATA:	Existing Conditions	Design Conditions
Top of Dam Elevation	1010.5	1011.6
Spillway Crest Elevation	1008.0	1008.0
Spillway Head Available (ft)	2.5	3.6
Type Spillway	rounded crest conc. weir	
"C" Value - Spillway	3.88	3.88
Crest Length - Spillway (ft)	35.2	34
Spillway Peak Discharge (cfs)	530	900
Auxiliary Spillway Crest Elev.	N/A	N/A
Auxiliary Spill. Head Avail. (ft)	N/A	N/A
Type Auxiliary Spillway	N/A	
"C" Value - Auxiliary Spill. (ft)	N/A	N/A
Crest Length - Auxil. Spill. (ft)	N/A	N/A
Auxiliary Spillway Peak Discharge (cfs)	N/A	N/A
Combined Spillway Discharge (cfs)	N/A	N/A

Spillway Rating Curve: $Q = CLH^{1.5}$ (King Handbook) (flashboards ignored)

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
1008	0		0
1008.5	40		40
1009	120		120
1009.5	235		235
1010	375		375
1010.5	530	N/A	530
1011	710		710
1011.2	780		780
1011.6	930		930
1012	1110		1110
1013	1610		1610

OUTLET WORKS RATING:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	999.1		
Invert of Inlet	UNK		
Type	RCP		
Diameter (ft) = D	1.5		
Length (ft) = L	62		
Area (sq. ft) = A	1.77		
N	0.011		
K Entrance	0.5		
K Exit	1.0		
K Friction $= 29.1 N^2 L/R^{4/3}$	.8		
Sum of K	2.3		
$(1/K)^{0.5} = C$	1.65		
Maximum Head (ft) = HM	12.1		
$Q = CA\sqrt{2g(HM)}$ (cfs)	32		
Q Combined (cfs)	32		

Data for Dam at Outlet of Subarea F (See sketch on Sheet D-4)

Name of Dam: Garson Dam

STORAGE DATA:

Elevation		Area (acres)		Storage million gals	Storage acre-ft		Remarks
999.1	=ELEVO	0		0	0		Stream bed
1008.0	=ELEV1	18	=A1		53	=S1*	normal Pool
1010.5		20			101		Emergency
1011.2		20			115		
1011.6		21			123		Top of Dam**
1020		23					USGS

* $S1 = \frac{A1\ (Elev1 - Elevo)}{3}$

** Planimetered contour at least 10 feet above top of dam

Reservoir Area at Normal Pool is 2 percent of subarea watershed.

BREACH DATA:

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: SM, CL

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) 2 fps
(from $Q = CLH^{3/2} = V \cdot A$ and depth = (2/3) x H) & A = L·depth

HMAX = $(4/9\ V^2/C^2)$ = .2 ft., C = 3.1 Top of Dam El.= 1011.6*

HMAX + Top of Dam El. = 1011.4 = FAILEL
(Above is elevation at which failure would start)

* LOW POINT NOTED IS ON MAIN EMBANKMENT. THE ... OF THE dogleg IS LOWER.

Dam Breach Data:

BRWID = 30 ft (width of bottom of breach)
Z = .5 (side slopes of breach)
ELBM = 999.1 (bottom of breach elevation, minimum of zero storage elevation)
WSEL = 1008.0 (normal pool elevation)
T FAIL= 6 mins = 0.1 hrs (time for breach to develop)

Selected Computer Output

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
**********************************
    1                A1                          NATIONAL DAM INSPECTION PROGRAM
    2                A2                      PALTIMORE DISTPICT CORPS OF ENGINEERS
    3                A3                           GORSON DAM
    4                B     300        0       15        0        0        0        0        0       -4        0
    5                B1      5
    6                J       1        6        1
    7                J1    1.0      0.5      0.4      0.3      0.2      0.1
    8                K       0        1                                          1
    9                K1          INFLOW TO SUNSET LAKE
   10                M       1        1     1.19             1.19                                    1
   11                P               21.9      111      123      133      142
   12                T                                                          1.0     0.05             0.02
   13                W    1.29     0.45
   14                X    -1.5    -0.05      2.0
   15                K       1        1                                          1
   16                K1          ROUTE THROUGH GORSON DAM
   17                Y                                        1        1
   18                Y1      1                                                -1008       -1
   19                Y4   1008   1008.5     1009     1010   1010.5     1011   1011.2   1011.6     1012     1013
   20                Y5      0       40      120      375      530      710      780      930     1110     1610
   21                $A      0       18       28
   22                $E  999.1     1008     1020
   23                $$   1008
   24                $D1010.5      3.1      1.5
   25                $L      0      130      160      251      590      612      631
   26                $V1010.5   1011.0   1011.2   1011.5   1012.0   1012.5   1013.0
   27                K      99
```

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 1.00	RATIO 2 .50	RATIO 3 .40	RATIO 4 .30	RATIO 5 .20	RATIO 6 .10
HYDROGRAPH AT	1	1.19	1	2989.	1494.	1195.	897.	598.	299.
		(3.08)		(84.63)(	42.31)(	33.85)(	25.39)(	16.93)(	8.46)(
ROUTED TO	1	1.19	1	2977.	1475.	1164.	843.	528.	257.
		(3.08)		(84.29)(	41.75)(	32.95)(	23.86)(	14.94)(	7.28)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ..... (Low point on top)

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1008.00	1008.00	1010.50
STORAGE	53.	53.	101.
OUTFLOW	0.	0.	530.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1012.34	1.84	139.	2977.	8.75	41.00	0.00
.50	1011.71	1.21	125.	1475.	5.75	41.25	0.00
.40	1011.47	.97	120.	1164.	4.75	41.25	0.00
.30	1011.12	.62	113.	843.	3.50	41.50	0.00
.20	1010.49	0.00	101.	528.	0.00	42.00	0.00
.10	1009.54	0.00	82.	257.	0.00	42.00	0.00

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
**********************************
    1                A1                          NATIONAL DAM INSPECTION PROGRAM
    2                A2                    BALTIMORE DISTRICT CORPS OF ENGINEERS
    3                A3                          GORSON DAM
    4                B     300       0        6        0        0        0        0        0       -4        0
    5                B1      5
    6                J       2       1        1
    7                J1    0.4
    8                K       0       1                                          1
    9                K1          INFLOW TO SUNSET LAKE
   10                M       1       1     1.19              1.19                                    1
   11                P               21.9      111      123      133
   12                T                                                          1.0     0.05              0.02
   13                N    1.29    0.45
   14                X    -1.5   -0.05      2.0
   15                K       1       1                                          1
   16                K1          ROUTE THROUGH GORSON DAM
   17                Y                                 1        1
   18                Y1      1                                                -1008      -1
   19                Y4   1008    1008.5    1009     1010   1010.5     1011   1011.2   1011.6     1012     1013
   20                Y5      0      40      120      375      530      710      780      930     1110     1610
   21                $A      0      18       28
   22                $E  999.1    1008     1020
   23                $$   1008
   24                $D1010.5       3.1      1.5
   25                $L      0     130      160      251      590      612      631
   26                $V1010.5    1011.0   1011.2   1011.5   1012.0   1012.5   1013.0
   27                $B     30     0.5    999.1      0.1   1008.0   1020.0
   28                $B     30     0.5    999.1      0.1   1008.0   1011.4
   29                K       1       2
   30                Y                                 1        1
   31                Y1      1                                                   -1
   32                Y6   .100     .05     .100      997     1010       50     .20
   33                Y7      0    1020       90     1000      100      998      106      997      109      997
   34                Y7    109     998      120     1000      300     1010
   35                K       1       3
   36                Y                                 1        1
   37                Y1      1                                                   -1
   38                Y6   .100     .05     .100      897      920     1825     .055
   39                Y7      0     940      200      920      280      900      280      897      286      897
   40                Y7    300     900      480      920      600      940
   41                K       1       4
   42                Y                                 1        1
   43                Y1      1                                                   -1
   44                Y6   .100     .05     .100      880      890      525     .032
   45                Y7      0     900      100      890      190      883      190      880      196      880
   46                Y7    196     883      400      886      410      890
   47                K       1       5
   48                Y                                 1        1
   49                Y1      1                                                   -1
   50                Y6   .06      .05      .06      860      880      500      .04
```

D-11

```
51  Y7    0   890   100   880   300   863   300   860   306   860
52  Y7  306   863   700   880  1150   900
53  K     1     6
54  Y                         1     1                      -1
55  Y1    1
56  Y6  .06   .05   .06   840   860   500   .04
57  Y7    0   880    60   860   147   845   147   840   153   840
58  Y7  153   845   180   860   250   870
59  K     1     7
60  Y                         1     1                      -1
61  Y1    1
62  Y6  .06   .05   .06   800   820  1250  .032
63  Y7    0   840    10   820    56   805    56   800    62   800
64  Y7   62   805   100   820   150   830
65  K     1     8
66  Y                         1     1                      -1
67  Y1    1
68  Y6 .100   .05  .100   740   760  2230  .027
69  Y7    0   780    20   760   210   745   210   740   216   740
70  Y7  216   745   290   760   350   780
71  K     1     9
72  Y                         1     1                      -1
73  Y1    1
74  Y6 .100   .05  .100   680   700  2200  .027
75  Y7    0   710    50   700   165   685   200   680   203   680
76  Y7  238   685   300   700   380   720
77  K     1    10
78  Y                         1     1                      -1
79  Y1    1
80  Y6 .100   .05  .100   360   380  3540   .09
81  Y7    0   400    50   380   100   365   120   360   125   360
82  Y7  145   365   200   380   270   400
83  K    99
```

D-12

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .40
HYDROGRAPH AT	1	1.19	1	1202.
	(	3.08)	(	34.03)(
			2	1202.
			(	34.03)(
ROUTED TO	1	1.19	1	1162.
	(	3.08)	(	32.89)(
			2	5065.
			(	143.42)(
ROUTED TO	2	1.19	1	1162.
	(	3.08)	(	32.89)(
			2	5005.
			(	141.72)(
ROUTED TO	3	1.19	1	1162.
	(	3.08)	(	32.89)(
			2	4692.
			(	132.85)(
ROUTED TO	4	1.19	1	1161.
	(	3.08)	(	32.87)(
			2	4705.
			(	133.22)(
ROUTED TO	5	1.19	1	1160.
	(	3.08)	(	32.86)(
			2	4511.
			(	127.72)(
ROUTED TO	6	1.19	1	1161.
	(	3.08)	(	32.87)(
			2	4326.
			(	122.49)(
ROUTED TO	7	1.19	1	1161.
	(	3.08)	(	32.88)(
			2	4444.
			(	125.83)(
ROUTED TO	8	1.19	1	1157.
	(	3.08)	(	32.75)(
			2	3734.
			(	105.74)(
ROUTED TO	9	1.19	1	1156.
	(	3.08)	(	32.72)(

			2	3807.
				(107.81)(
ROUTED TO	10	1.19	1	1155.
		(3.08)		(32.70)(
			2	3673.
				(104.01)(

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SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1008.00	1008.00	1010.50
STORAGE	53.	53.	101.
OUTFLOW	0.	0.	530.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.40	1011.47	.97	120.	1162.	4.60	17.20	0.00

PLAN 2 ••••••••••••••

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1008.00	1008.00	1010.50
STORAGE	53.	53.	101.
OUTFLOW	0.	0.	530.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.40	1011.41	.91	119.	5065.	1.13	16.90	16.80

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PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1162.	1000.7	17.20

PLAN 2 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	5005.	1003.5	16.90

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1162.	901.7	17.20

PLAN 2 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	4692.	905.3	17.00

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1161.	885.5	17.20

PLAN 2 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	4705.	887.6	17.00

PLAN 1 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1160.	865.6	17.30

PLAN 2 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	4511.	867.9	17.00

PLAN 1 STATION 6

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1161.	848.9	17.30

PLAN 2 STATION 6

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	4326.	853.0	17.00

PLAN 1 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1161.	809.6	17.30

PLAN 2 STATION 7

MAXIMUM	MAXIMUM	TIME

RATIO	FLOW,CFS	STAGE,FT	HOURS
.40	4444.	814.4	17.10

PLAN 1 STATION 8

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1157.	749.0	17.40

PLAN 2 STATION 8

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	3734.	752.3	17.20

PLAN 1 STATION 9

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1156.	684.2	17.50

PLAN 2 STATION 9

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	3807.	686.5	17.20

PLAN 1 STATION 10

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	1155.	363.8	17.50

PLAN 2 STATION 10

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.40	3673.	366.0	17.20

BY ____ DATE 5/5/81 SUBJECT Gorson Dam (Supper Lake) SHEET NO ____ OF ____
CHKD BY ____ DATE ____ JOB NO ____

Gorson Dam

Summary of Pertinent Results

Multi-ratio Analysis	PMF	½ PMF	40% PMF
Rainfall (inches)	24.88	____	____
Runoff (inches)	22.54	11.27	9.06
Peak Inflow (cfs)	2,989	1,494	1,195
Peak Outflow (cfs)	2,976	1,475	1,164
Depth of Overtopping (ft)	1.84	1.21	.97
Duration of Overtopping (hrs)	8.75	5.75	4.75

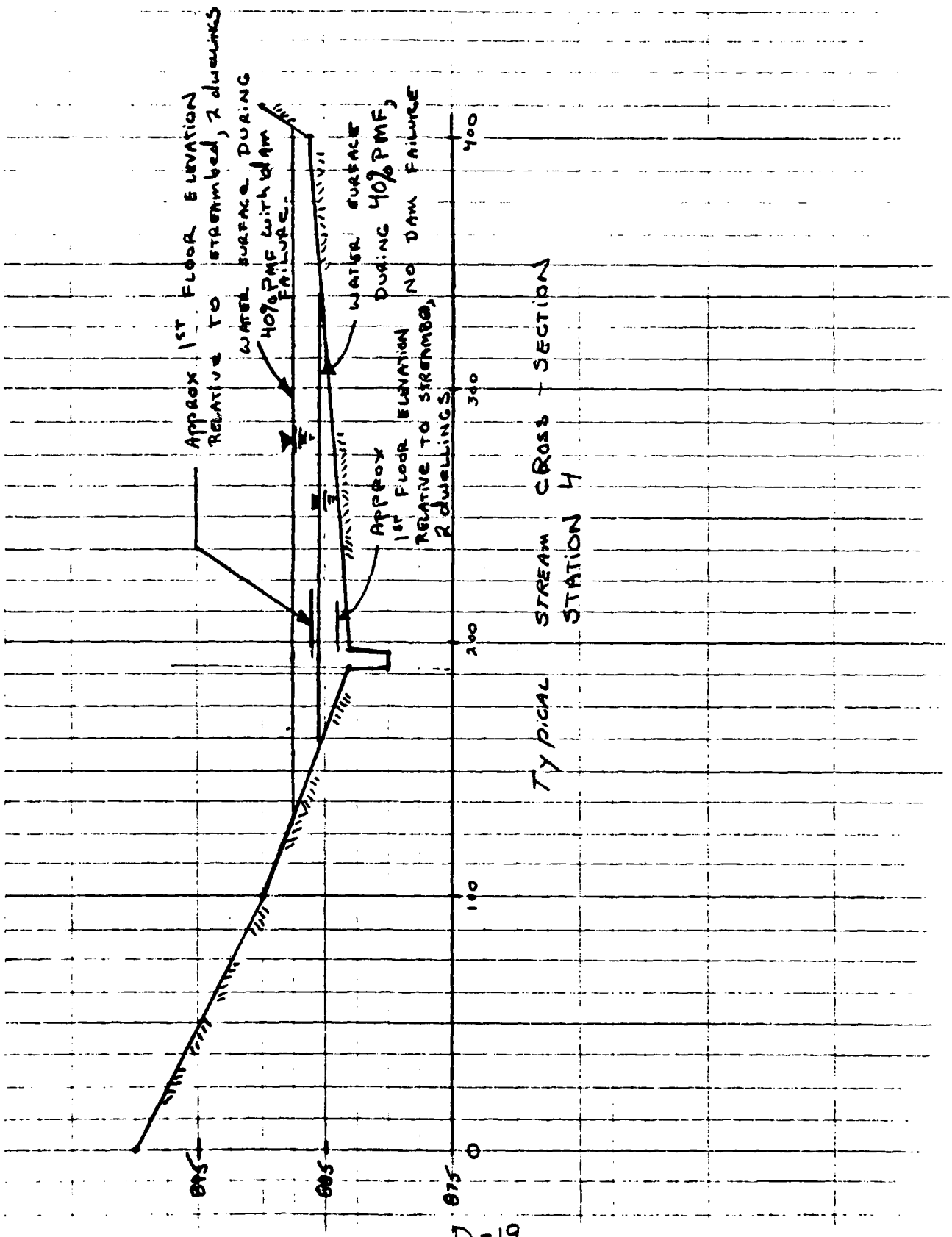
Breach and Channel Routing Analysis (40% PMF)

	Failure	no Failure	Difference
Peak Outflow (cfs)	5,065	1,162	3,903
Stream Depth (ft)			
At Section 3	8.3	4.7	3.6
Section 4*	7.6	5.5	2.1
Section 5	7.9	5.6	2.3
Section 6	13.0	8.9	4.1

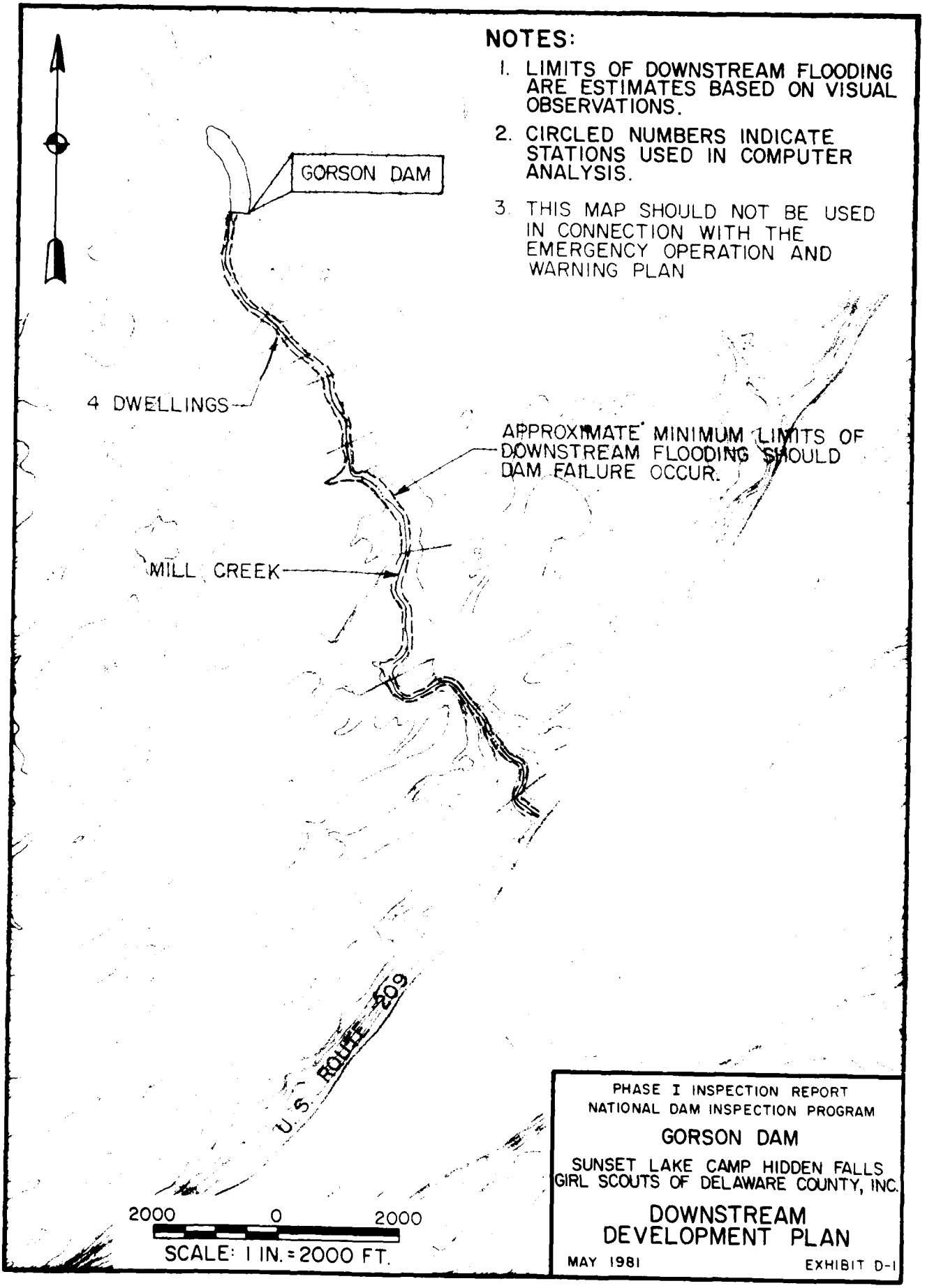
* SEE SECTION ON NEXT [illegible]

BY _____ DATE _____ SUBJECT _____ SHEET NO _____ OF _____

CHKD BY _____ DATE _____ JOB NO _____

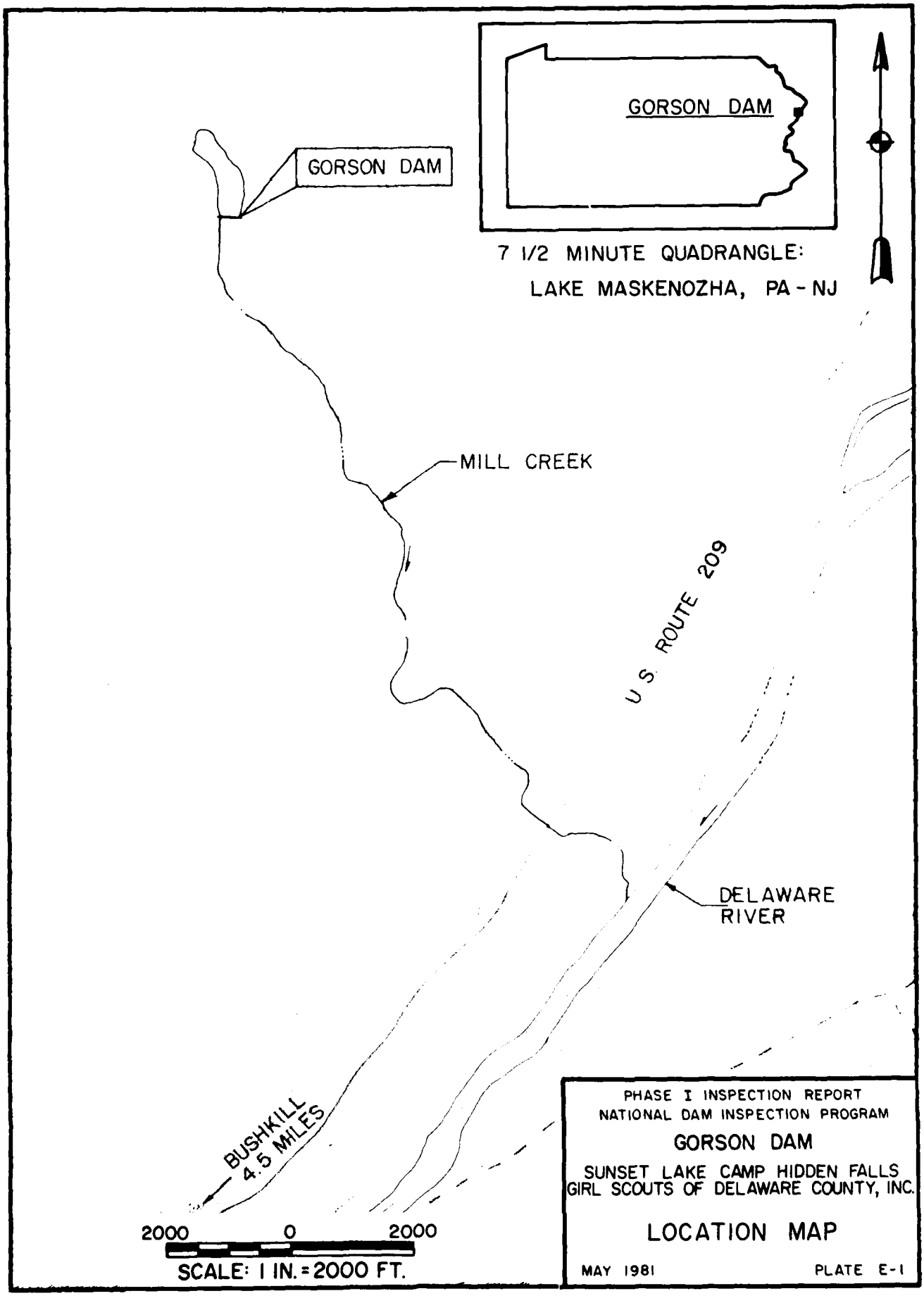


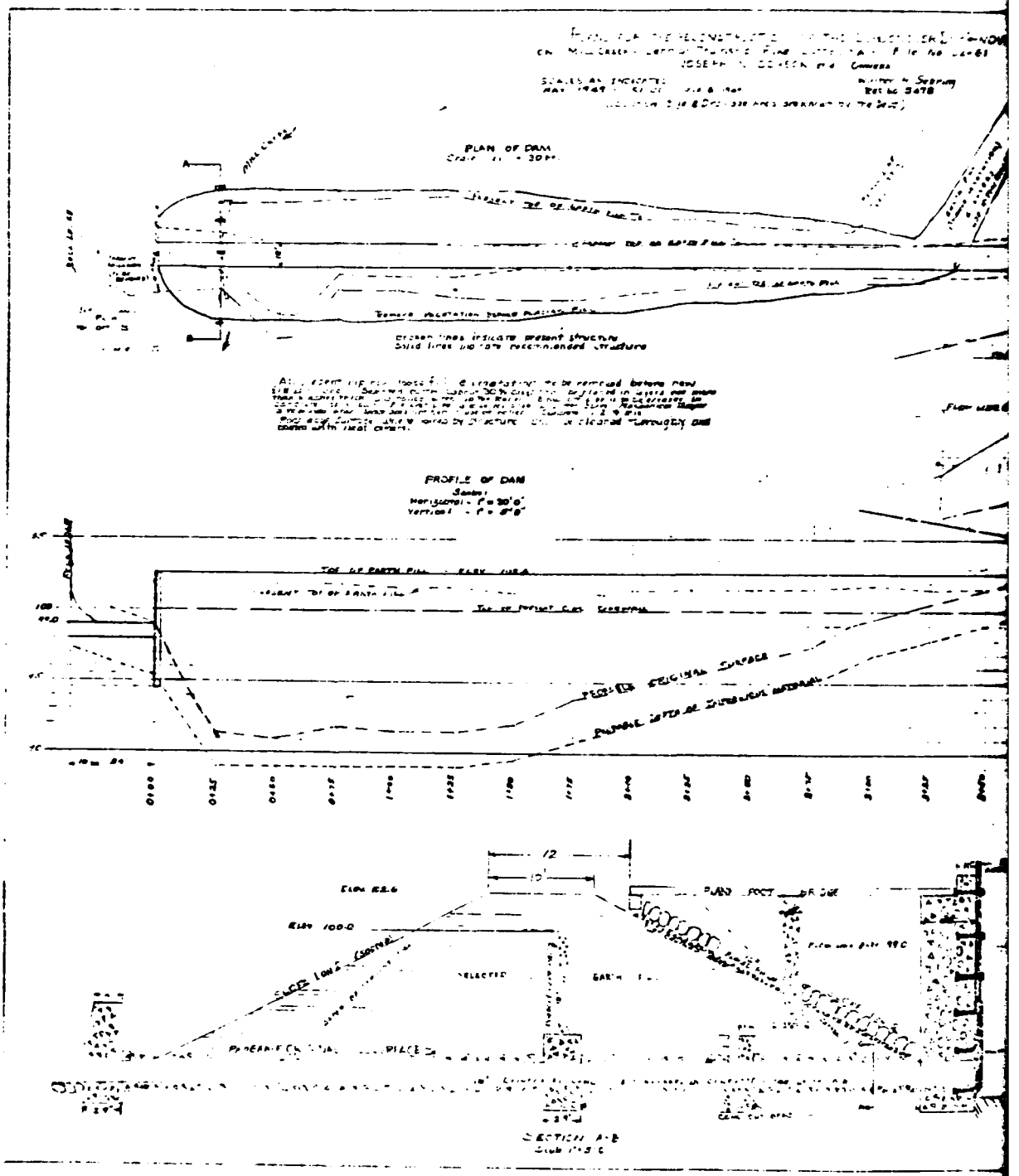
TYPICAL STREAM CROSS-SECTION STATION 4

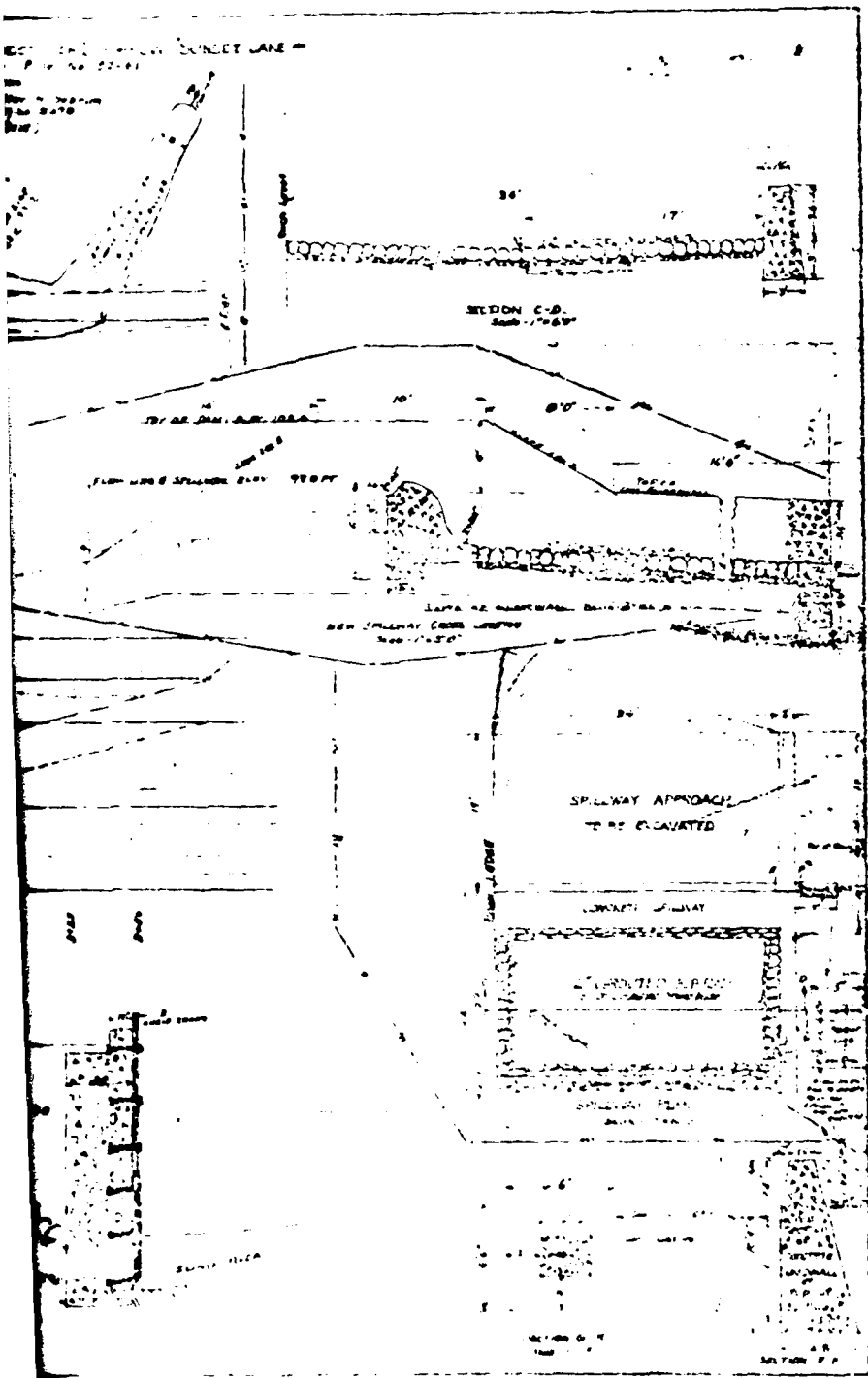

NOTES:
1. LIMITS OF DOWNSTREAM FLOODING ARE ESTIMATES BASED ON VISUAL OBSERVATIONS.
2. CIRCLED NUMBERS INDICATE STATIONS USED IN COMPUTER ANALYSIS.
3. THIS MAP SHOULD NOT BE USED IN CONNECTION WITH THE EMERGENCY OPERATION AND WARNING PLAN
GORSON DAM
4 DWELLINGS
APPROXIMATE MINIMUM LIMITS OF DOWNSTREAM FLOODING SHOULD DAM FAILURE OCCUR.
MILL CREEK
U.S. ROUTE 209
2000 0 2000
SCALE: 1 IN. = 2000 FT.
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
GORSON DAM
SUNSET LAKE CAMP HIDDEN FALLS
GIRL SCOUTS OF DELAWARE COUNTY, INC.
DOWNSTREAM
DEVELOPMENT PLAN
MAY 1981
EXHIBIT D-1

APPENDIX E

PLATES


GORSON DAM
GORSON DAM
7 1/2 MINUTE QUADRANGLE:
LAKE MASKENOZHA, PA - NJ
MILL CREEK
U.S. ROUTE 209
DELAWARE RIVER
BUSHKILL
4.5 MILES
2000 0 2000
SCALE: 1 IN. = 2000 FT.
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
GORSON DAM
SUNSET LAKE CAMP HIDDEN FALLS
GIRL SCOUTS OF DELAWARE COUNTY, INC.
LOCATION MAP
MAY 1981
PLATE E-1


PLAN OF DAM
PROFILE OF DAM
SECTION A-B



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

GORSON DAM

SUNSET LAKE CAMP HIDDEN FALLS
GIRL SCOUTS OF DELAWARE COUNTY, INC.

PLAN, PROFILE
AND SECTIONS

MAY 1981 PLATE E-2

APPENDIX F

GEOLOGY

GORSON DAM

APPENDIX F

GEOLOGY

Gorson Dam is located in Pike County within the Appalachian Plateau Physiographic Province. The most pronounced topographic feature in the area is Camelback Mountain, which is part of the Pocono Plateau Escarpment. The escarpment has a well-defined, southwestward trend from Camelback Mountain, but is is irregular between Camelback Mountain and Mt. Pocono, which lies to the north. Streams east of the escarpment drain directly to the Delaware River, while those to the west drain to the Lehigh River.

The Pocono Plateau Section lies to the west of the escarpment. This area is relatively flat, with local relief seldom exceeding 100 feet. The topography has been greatly influenced by continental glaciation. Many features were created by deposition of glacial materials. The entire plateau lacks well-developed drainage.

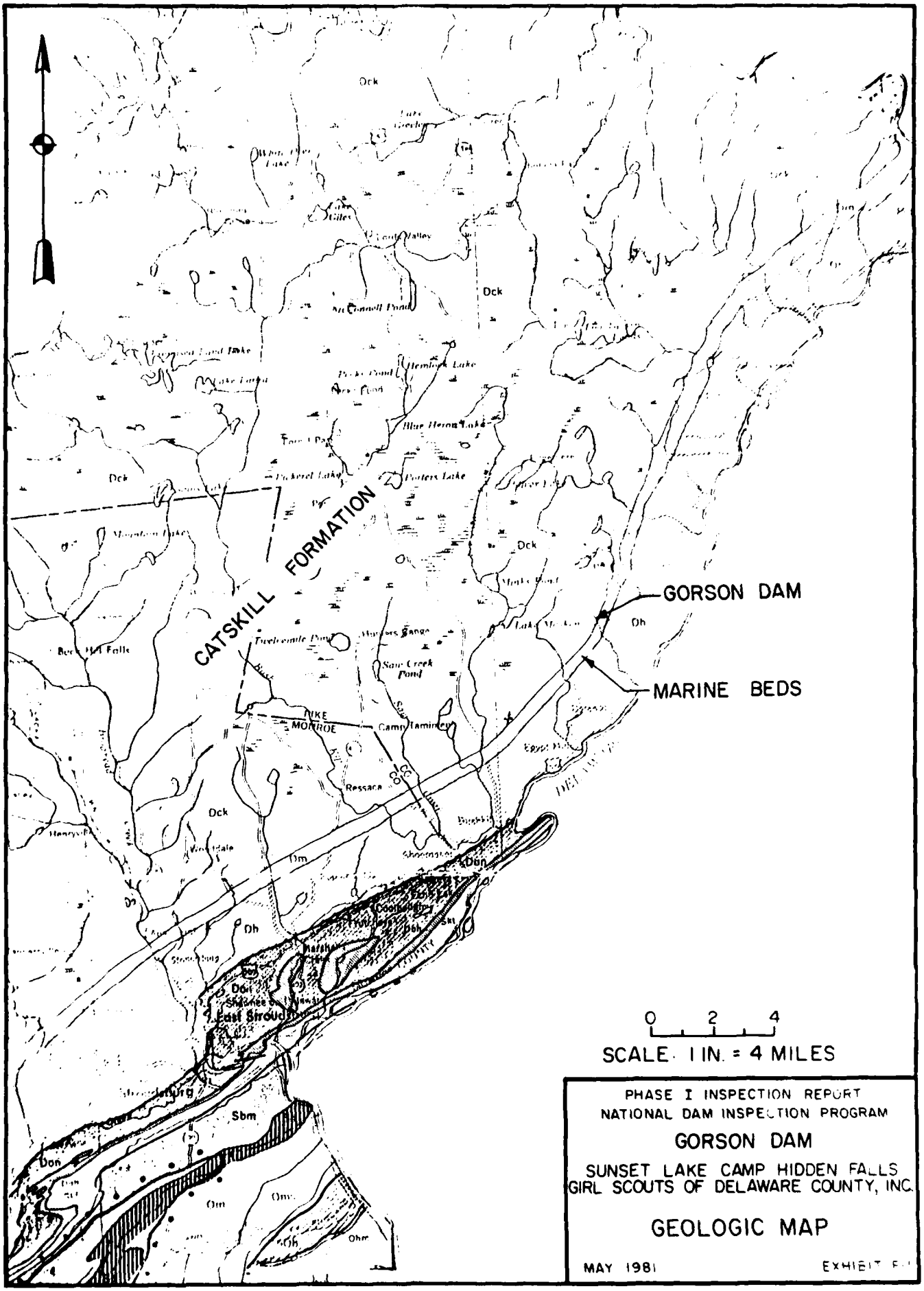
East of the escarpment is the Glaciated Low Plateaus Section of the province. This area is characterized by preglacial erosional topography with locally-thick glacial deposits. Local relief is generally 100 to 300 feet.

Bedrock units of the sections described above are the lithified sediments of offshore marine, marginal marine, deltaic environments, and fluvial environments associated with the Devonian Period. These units include siltstones of the Mahantango Formation, siltstones and shales of the Trimmers Rock Formation, and seven mapped members of the Catskill Formation. These members include sandstones, siltstones and shales of the Towamensing Member; sandstone, siltstone and shale of the Walcksville Member; sandstones, siltstones and shale of the Beaverdam Run Member; sandstone and shale in the Long Run Member; sandstones and conglomerates in the Packerton Member; sandstones and some conglomerates in the Poplar Gap Member; and sandstones and conglomerates in the Duncannon Member.

Gorson Dam is underlain by the Catskill Formation. The Catskill Formation is predominantly red to brownish gray shales and sandstone with interbedded siltstones and conglomerates. Sandstones present are thickbedded, fine- to coarse-grained and exhibit very low primary porosity due to a clay and silica matrix. Effective porosity results from fractures and parting planes.

The rocks are well-indurated and generally are not susceptible to slope failure; however, the presence of well-developed bedding and joint planes will result in some rockfall from vertical and high-angle cut slopes.

Bedrock is entirely overlain by glacial till of Late Wisconsin Age. This till is an unsorted mixture of clay, silt, sand, and gravel. It is moderately cohesive and is generally derived locally from the sandstones of the Catskill Formation. Thickness of the till varies from 5 to 75 feet. Available information indicates that the dam is founded on "hardpan," which is probably this till. Rock outcrop exists only at the right abutment.



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

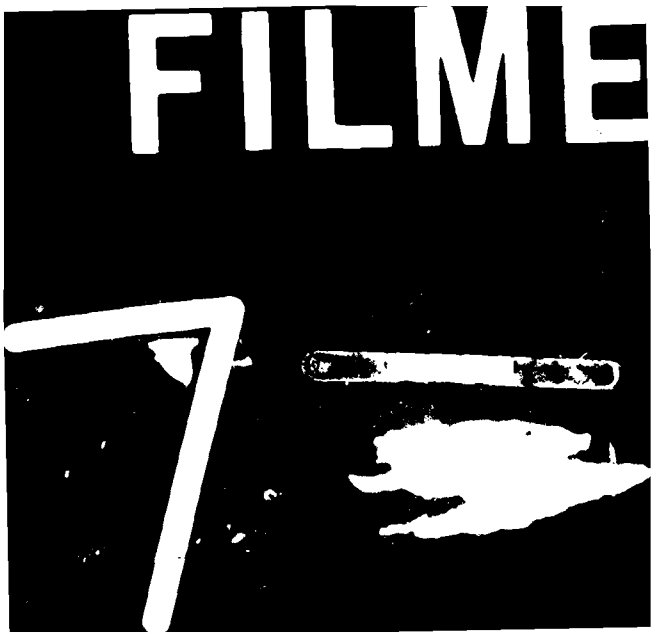
GORSON DAM

SUNSET LAKE CAMP HIDDEN FALLS
GIRL SCOUTS OF DELAWARE COUNTY, INC.

GEOLOGIC MAP

MAY 1981

EXHIBIT F-1


FILME